

April 1950

E-797

United States Department of Agriculture
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine

EFFECTIVENESS OF METHOXYCHLOR AGAINST THE JAPANESE BEETLE

By Walter E. Fleming and Warren W. Maines
Division of Fruit Insect Investigations

Tests were made in 1946 to determine the effectiveness of methoxychlor in protecting fruit and foliage from attack by adult Japanese beetles (Popillia japonica Newm.), and in 1947 this insecticide was tested against the grubs of this beetle in the soil. In these tests methoxychlor was compared with DDT.

Control of Adult Beetles

A peach orchard near Cranbury, N. J., containing the varieties Triogen, Sunhigh, Goldeneast, Elberta, J. H. Hale, Summercrest, Red-rose, Goldenglobe, Cumberland, and Raritan Rose was selected for one of the tests in 1946. This orchard had been damaged severely by adult Japanese beetles each year for several years. On July 10, just as the beetles were beginning to invade the orchard, the trees were sprayed with methoxychlor or DDT, or with each of these materials in combination with hydroxypentamethylflavan. The sprays contained 2 pounds of 50-percent methoxychlor or DDT wettable powder in 100 gallons, and when hydroxypentamethylflavan was added 4 pounds of a 30-percent wettable powder was used. The hydroxypentamethylflavan was added to control the European red mite (Paratetranychus pilosus (C. and F.)), which sometimes increases rapidly after applications of DDT. Each spray was applied to 59 trees, which included all the varieties in the orchard. Many Japanese beetles were killed by the contact action of these sprays. The infestation was destroyed, and only an occasional beetle was observed on the trees during the remainder of the summer. Methoxychlor proved to be as effective as DDT in protecting the fruit and foliage from attack.

The average numbers of adult mites per leaf on the varieties Summercrest and Cumberland, as estimated at different intervals after the spraying, were as follows:

	<u>20 days</u>	<u>27 days</u>	<u>33 days</u>
Methoxychlor	103	123	143
Methoxychlor-hydroxypentamethylflavan	69	97	142
DDT	258	45	213
DDT-hydroxypentamethylflavan	38	23	75
Unsprayed	65	84	180

The results indicate that the European red mite tends to build up more rapidly on foliage sprayed with methoxychlor or DDT than on the unsprayed foliage. The sprays containing hydroxypentamethylflavan did not give satisfactory control of the mites.

In another test in 1946 methoxychlor from two sources was compared with DDT in a block near Bridgeton, N. J., containing a variety of peach designated as N. J. 135. Before the spray applications many beetles were feeding on the fruit and foliage on the trees. Each spray contained 2 pounds of a 50-percent wettable powder in 100 gallons of water and was applied to 21 trees. Many beetles were killed by both sprays. Two days after the spraying many dead beetles were found on the ground beneath the trees and only an occasional beetle was observed on the fruit or foliage. There seemed to be more dead beetles under the trees sprayed with DDT than under those sprayed with methoxychlor. The beetles caused no further injury during the remainder of the summer. Methoxychlor from both sources was as effective as DDT in protecting the fruit and foliage from Japanese beetle injury.

On June 24, 1946, about a week before the beetles began to invade the orchard, blocks of large Williams Early Red apple trees were sprayed with methoxychlor or DDT. The trees were sprayed at this time because it was anticipated that the apples would be picked during the first week in July and it was desirable that 10 to 14 days elapse between spraying and harvest to avoid the possibility of objectionable residues on the fruit. However, market conditions were such that the crop was not harvested. Each material was applied to 26 trees at the rates of 1 and 2 pounds of a 50-percent wettable powder per 100 gallons of water.

On July 17 some beetle injury was observed on the tips of the twigs on trees sprayed with 2 pounds of 50-percent DDT, but few live beetles were seen on the trees, and many dead or moribund beetles were on the ground. The situation was almost the same with the trees sprayed with 1 pound of 50-percent DDT, but there had been slightly more feeding on the tips of the twigs and fewer dead or moribund beetles were on the ground. The trees sprayed with 2 pounds of 50-percent methoxychlor showed evidence of more feeding than those sprayed with 1 pound of 50-percent DDT; more beetles were seen in the trees and fewer dead and moribund beetles were on the ground. Further observations on this test were not possible after July 17, because a few days later practically all the beetles left both the sprayed and the unsprayed trees.

Control of Grubs

In laboratory tests against Japanese beetle grubs in the soil, methoxychlor from two sources (samples A and B in table 1) was intimately mixed with 1-cubic-foot lots of Sassafras sandy loam at the rates of 0.42, 1.04, 2.08, 4.16, and 8.32 grams per cubic foot, which was equivalent to incorporating 10, 25, 50, 100, and 200 pounds of the

insecticide with the upper 3 inches of an acre of soil. Sassafras sandy loam was treated with DDT in a similar manner at rates equivalent to 10, 25, and 50 pounds per acre. Ten-percent dusts were used to facilitate mixing the materials with the soil. Each cubic foot of treated soil was divided among five trays, each 18 inches square and 3-3/4 inches deep, and the trays were then put into a chamber maintained at a temperature of 80° F. Immediately after the soil had reached this temperature and again 7 weeks later, 250 third-instar larvae, 50 per tray, were introduced for each treatment. The trays were examined at weekly intervals, and the dead and living individuals counted. The living larvae were returned to the tray and the dead individuals were discarded. As approximately the same results were obtained with larvae introduced immediately and 7 weeks after the soil reached 80°, the data were combined. The mortality of 500 grubs receiving each treatment is given in table 1.

Table 1.--Comparative effectiveness of methoxychlor and DDT against Japanese beetle grubs in the soil

	: Pounds	:	Percent mortality of 500 grubs		
Material	: per acre	:	Second	: Third	: Fourth
	:	:	week	: week	: week
<hr/>					
Methoxychlor:					
Sample A	10		10.8	14.8	21.4
	25		20.2	30.6	35.6
	50		57.6	79.2	89.6
	100		85.8	98.0	100.0
	200		93.4	99.6	100.0
Sample B	10		8.0	9.6	16.2
	25		19.6	25.6	32.4
	50		57.8	70.8	75.8
	100		87.8	95.4	98.4
	200		96.4	97.6	99.0
DDT	10		85.6	97.4	99.6
	25		97.2	99.8	100.0
	50		98.8	100.0	100.0
Untreated check	--		9.4	12.2	16.8

The data obtained the first week were not tabulated, because many of the grubs were moribund and the mortality could not be determined accurately. Approximately the same results were obtained with methoxychlor from both sources, but this material was much less toxic to grubs than DDT. The insecticidal action with 100 pounds of methoxychlor per acre was about the same as that with 10 pounds of DDT per acre. In view of the relatively low toxicity of methoxychlor to beetle grubs, plans for further tests with this material in the field were abandoned.



Summary

In limited tests methoxychlor was as effective as DDT in protecting the fruit and foliage of peaches from attack by the adult Japanese beetle (Potillia japonica Newm.), but slightly less effective than DDT in protecting early-ripening apples from injury.

Methoxychlor was only one-tenth as toxic as DDT to Japanese beetle grubs in the soil. In view of this low toxicity, it would not be a suitable substitute for DDT in controlling grubs in turf or in nursery and garden soils.